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ORIGINAL ARTICLES.

PELLAGRA AND SOME OF ITS PROBLEMS.[1]

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Extended research on the part of scientific men, physicians and others, in the several countries of Europe where pellagra has long prevailed, has resulted in the production of a literature that is as vast as it is illuminating. The relatively recent appearance of the disease on this side of the Atlantic has awakened a special interest in the subject, not merely among American observers, but also among authorities, both Italian and English, who have learned with no little surprise of the new chapter to be written in this century on the history of the disorder. In the limits of the present paper only the briefest reference can be made to the labors of the authors whose names have been identified with the study of the malady. The attempt is here made briefly to sketch, as far as may be, the phenomena of the disease as they have been recognized in this country, and incidentally to formulate some of the problems with which the students of pellagra in the United States apparently are confronted.

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[1] The record of neurological symptoms in the patients described in this paper was made by Peter Bassoe, M.D., assistant professor of nervous and mental diseases in the Rush Medical College; and the record of blood-findings, including the bacteriology in nine patients, was made by D. J. Davis, M.D., instructor in pathology and medicine in Rush Medical College. The author is greatly indebted to these gentlemen for these reports, and desires to express his thanks to Dr. J. W. Babcock, physician and superintendent of the State Hospital for the Insane, Columbia, South Carolina, for the privilege of examining pellagra patients, both public and private, during the session of the National Pellagra Conference held in that city on November 3 and 4, 1909; and unites with his collaborators in acknowledging obligations to Dr. George A. Zeller and Dr. George Michell, of the Peoria State Hospital for the Insane, Bartonville, Illinois, for permission to observe and make special study of pellagrous patients in that institution; also to Dr. V. H. Podstata, superintendent and physician of the Hospital for the Insane at Elgin, Illinois; and to Dr. L. J. Pollock, physician of the Cook County, Illinois, Asylum for the Insane, for the opportunity of making examination of other pellagrous patients in these institutions.

Many of the several names which have been given to the disease reflect the opinions once prevalent respecting its nature and cause. It has been termed Mal de la Rosa, Risipola Lombarda, Lombardy Erysipelas, Lepra Italica, Alpine Scurvy, Mal Rosso, Mal Roxo, Maïdica, Psychoneurosis Maïdica, Maladie de la Teste, Malattie della Miseria, Mal de Sole, Mal de Asturias, Raphania Maïstica, Malattia dell' Insolato di Primavera; and other titles have been employed in its designation. Though vaguely recognized before his time, the first authentic description of the disease was made by a Spanish physician, Gaspar Casal, under the title Mal de la Rosa, the fruit of observation made by him among the peasants of the Asturias in the year 1735. His work was written in the Latin tongue, and published after his death by Joseph Garcia in the year 1762. In this monograph the portrait (Fig. 1) illustrating the localization of the disease correctly represents its cutaneous stigmas as they are betrayed today. His description of the pellagrous skin is noticeably accurate: "Degenerat tandem in crustam siccissimam, scabrosam, nigricantem, profundis sæpissime intercissam fissuris, etc."

Frapolli, of Milan, in 1771, is commonly reported as first to have given the name to the disease by which today it is most generally known, but in fact he merely reproduced a title current among the people of his day: "Morbus, vulgo, Pellagra." In the long list of authors who followed, from Strambio, Marzari, Alibert, Rayer, and Raymond, to Lombroso, Sandwith, Babes and Sion, and Sir Patrick Manson, can be traced the progress of the disease in Europe from Spain to Southern France, northern and central Italy, Corfu, upper Egypt, and other parts of Africa, Austria, Servia, Bulgaria, Roumania, Asia Minor, India, Mexico, Barbadoes, and portions of North and South America.

The prevalence of the disorder in Europe may be estimated to a degree from its ravages in Italy, which has suffered more than any one other country. In Lombardy alone from the year 1770, when attention was first paid to the serious character of the endemic, to the year 1880 the number of pellagrins increased from 20,000 to 104,067. It has been estimated that in a population of 16,689,735, of northern and central Italy, the proportion of those affected with the disease rose from one in sixty to one in nineteen of the inhabitants. At the present time, thanks to the extraordinary efforts of the Government in the matter of improving the hygienic and especially the dietetic habits of the peasantry, a marked decrease

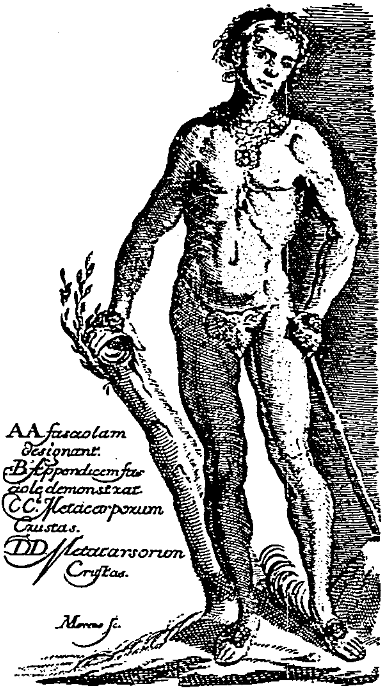
AA. fasciolam designant.
B. Appendicem fasciolæ demonstrat.
CC. Metacarporum Crustas.
DD. Metatarsorum Crystas.
Moreno fc.

FIG. 1.—Casal's illustration of cutaneous lesions in pellagra.

has been accomplished in the number of fresh cases of the disease; and in a few districts where there was a readiness to conform to the regulations provided by the State, it is reported that pellagra has been practically eradicated.

The great multiformity in the symptoms displayed in different cases, and the obvious influence of the rays of solar light in the production of certain of the cutaneous phenomena, have led several authors to an opinion, formulated by Winternitz in 1876, that there is not a nosological entity which corresponds to the term pellagra. Bonnet, four years later, and other writers, descanting upon supposed cases of "pseudopellagra," lean to the same conclusion, a conclusion which seems to have been shared by several modern observers, and which gave weight to the French aphorism that pellagrins are *"des malades sans une maladie."* Reference is made to this opinion chiefly with a view to emphasizing the fact that pellagra, as its phenomena have been unfolded before the clinicians of our day, is a disorder of admitted contradictions, of complexity of morbid symptoms, of strange subversions of any determinate order of evolution. Yet, all said and done, a conscientious study of the disease leads to the conviction that pellagra, in its complexus of symptoms, is a distinct affection, resembling none other, and, despite irregularity in the order of its manifestations impressed with a definite and characteristic physiognomy. Its poison, though as yet unrecognized, is probably one; the effects of that poison, operating upon a wide field of the human economy, wider than in most of the serious endemic maladies of the human family, are many.

Pellagra is neither infectious, contagious, nor inherited. In countries where labor in the fields is accomplished chiefly by men, these suffer more than women. Elsewhere, the subjects of the disease are in larger proportion women. The one chief predisposing factor in its production is, without question, the asthenic condition of a poverty-stricken, poorly nourished, and enfeebled class of subjects. Though not inherited, pellagra may affect children at an early age; the larger number of patients, however, develop its symptoms between the close of the second and of the fifth decade of life. That it is a disorder chiefly developed in warm countries can scarcely be doubted apart from the arguments adduced in favor of its close connection with the crops raised within certain fixed geographical limits. The southern portions of Europe have unmistakably suffered more than those in the extreme north. The probable geographical limits lie between 40° and 50° north latitude.

The effects of pellagrous intoxication of the human body are exerted chiefly in three systems of the economy—the nervous, the cutaneous, and the gastro-intestinal. The order and importance of these is not exactly determined. Examining the three from different points of view, authors have attributed sometimes to one of these and again to another a chief importance. But the cutaneous symptoms have not only given to pellagra its most commonly employed designation (Ital., *pelle*, skin; *agra*, rough), but, further, have furnished its most constant and determinate features. It is possible that there may be a *pellagra sine pellagra*, but few clinicians would venture to make a diagnosis of this sort in any sporadic case beyond the limits of a pellagrous district.

The classical type of pellagra recognized in Europe may be briefly described as follows (the American variations from the Italian and Egyptian portraits will be noticed in passing):

The question of a distinct prodromal period introduces at once to the confusion which has prevailed respecting many features of the disorder. By some it is believed that year after year, before the first unmistakable symptoms are betrayed, the patient experiences an increasing sensation of languor and of general malaise. It is clear, however, that even in the class of subjects who tolerate minor ailments with relative equanimity, in the early spring season of the year there is experienced an unwonted lassitude, vertigo, epigastric pain, bowel looseness, and inappetence. Often there is coincident involvement of the tongue, which may be coated, or become reddened and studded with prominent papillæ. More rarely there are superficial losses of its enveloping membrane, and in extreme cases, ulceration of the mucosa. Other uncomfortable symptoms experienced at this period are more or less severe headache, accompanied by vomiting. Pellagra has been described as a feverless disease. The temperature throughout may be normal. Again, by one of those odd anomalies which frequently are to be recognized in the course of the disease, all the gastro-intestinal symptoms may be ameliorated at the date of the onset of the cutaneous efflorescence. As the eruptive phenomena are practically alike in patients affected with pellagra on both sides of the Atlantic, the following may be held to be fairly descriptive of the average of cases, wherever observed. For the convenience of classification of symptoms, three stages are described by writers.

The eruption (pellagrous erythema) in the first stage develops, as a rule, suddenly and with practical symmetry, in the days of early spring, and is commonly limited to the uncovered parts of the body exposed to the sun's rays (the face, neck, hands, and, in those not clothing the lower limbs, also the feet). The entire face may be symmetrically involved, producing thus the pellagrous "mask" (Fig. 2). Often, however, portions only of the face are involved; the brow may be spared in men who wear hats; while in insane women, whose faces are less protected, we have seen characteristic "welts" across the upper portion of the forehead. In both sexes it is not rare to see the beardless chin involved; occasionally the cheeks also, to the exclusion of other parts.

The erythematous circlet about the neck (Ger., *Casal'sche*

Halsband; Ital., *Il collare pellagroso*), first depicted by Casal, is one of the characteristic stigmas of the disease. In front, distinct lines of demarcation can usually be recognized at the lower border of the "collar," representing the line of contact of the shirt or other garment protecting the inferior part of the neck. The upper border of the "collar" in front is often as distinctly outlined by reason of the protection from sunlight furnished by the chin. Behind, the "collar" stretches from the clothing below to the line of the hairs of the occiput. The ears may be simultaneously affected.

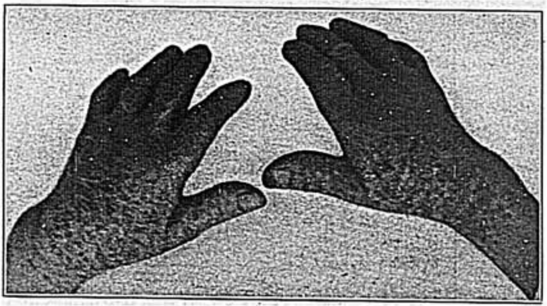

FIG. 3.—Pellagrous erythema of the hands. Patient not insane. (Courtesy of Dr. Michell.)

The dorsa of the hands present probably the most common and the most vivid of the cutaneous expressions of the disease. They are, as also the other affected surfaces, usually symmetrically involved, the eruptive symptoms when fully developed spreading evenly from the radial to the ulnar side of the hands, sparing the palms and nails (Fig. 3). In but a few cases, those seen by us in the South, have the palms been invaded by extension from the back of the hands. Raymond asserted categorically that the dorsum of the distal phalanx is never attacked, and this even when the region named has not been protected by the position assumed in grasping tools employed by the laborer in the open fields. These statements, however, have been negatived by numerous observations in every large experience.

Dr. Watson points to a characteristic extension of the pellagrous eruption on the hands to the flexor surface, beginning on the radial border, and reaching toward the ulnar by an oblique line forming an irregularly outlined triangular patch, its base at the radius, its apex near the ulnocarpal articulation.

The dorsa of the feet, when exposed equally with the hands, are similarly affected. The eruption covers the area from the distal phalanges of the toes to the malleoli, as a rule, sparing the heel.

In exceptional cases, departures from the type are striking. The "pellagrous boot" we have seen chiefly in Southern patients; the eruptive symptoms spreading somewhat unevenly from the foot to the upper third of the leg, displayed, as a rule, more abundantly in front than behind. In many cases we have seen distinct involvement of the knees when the legs were scarcely invaded The same is true of the upper extremities, the entire forearm becoming the seat of the eruption, with distinct limitation to the region exposed to the light, showing a line of demarcation at the wrist, the elbows being very distinctly involved, with circumscribed borders. Again, tongue-shaped prolongations may spread from the elbows downward as far as the middle of the forearm. Where the clothing worn by the day laborer has a V-shaped opening in front and behind (as is seen in some of the Egyptian sufferers),

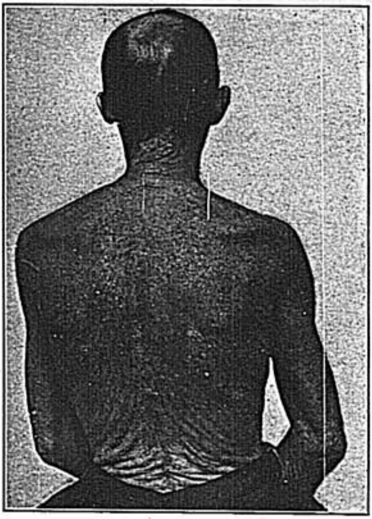

FIG. 4.—Pellagrous erythema, universal. (Courtesy of Dr. Miller.)

there is a corresponding localization of the eruption, the erythema spreading downward in a triangular patch, its base above both in front and behind. Similarly produced are the irregular areas of involved skin occasionally perceptible over one or both shoulders. The genital region in both sexes is at times attacked, notably the scrotum in men and, more often, the vulva in women. Miller has reported an instance of pellagra universalis (Fig. 4). Cases have been recorded, however, in which, after the exposure of the entirely nude body, the face, hands, and feet only have been involved (Neusser).

The hue of the exanthem differs according to the color scheme of the subject and the length of time during which it has existed. At first the color is a dull red, which has been likened to the appearance of the skin after a common sunburn; yet it is rare that the pinkish hue produced by the rays of the sun in the skin of a blond subject is precisely imitated. The pellagrous erythema at the outset, generally fading temporarily under pressure, is more reddish than pinkish, displayed at times with discrete macules which speedily fuse and produce, on the backs of the hands, for example, a uniformly smooth, reddened, and distinctly outlined area, suggesting, when the cuffs have definitely limited the efflorescence above, the appearance of a glove covering the back of the hand. In the milder cases the macular lesions may fade without producing the "mask" effect; more commonly the eruption persists to a complete involvement of the areas exposed to the light. As the evolution of the erythema advances, the color deepens, refuses to disappear under pressure, and at its height attains a reddish-brown, chocolate, or plum-colored shade, described as "livid bluish," a tint at times suggesting that of sepia. The first eruptive symptoms may disappear in a fortnight with epidermic exfoliation in light flakes, leaving behind a pigmentation differing according to the severity of the precedent engorgement.

The skin thus affected is tense, swollen, and the seat of burning rather than of pruritic sensations. The surface is very rarely scratched. In the dark races, especially the negro, the color of the eruption may take on a grayish hue, with deepening of the normal pigment of the part.

Cases exhibiting vesicular and bullous lesions, in both the northern and southern portions of this country, are popularly termed "wet" (Fig. 5), as contrasted with the "dry" form described above. In these instances vesicles and blebs develop, often with large elevations of the epidermis over chambered sero-pus, followed by desiccation, crusting, and rhagades. These are decidedly the rarer exhibitions of the exanthem, and are believed to be concomitants of the most serious phases of the systemic disorder.

In most of the first attacks the eruptive phenomena fade in a fortnight, leaving the skin pigmented, roughened, and, in the case of many of the poorer class not under hygienic management, begrimed with dirt.

Many, indeed, of the American patients have a recrudescence of the exanthem in the autumn, some under our observation suffering even from repeated attacks in one season; while the type cases of Italian writers undergo a relighting of the morbid process in the skin, only at the succeeding season of spring (second stage), when possibly, without the production of as vivid an exanthem as at the first, the skin again becomes dull reddish in hue, is more deeply infiltrated, and, when the exacerbation passes, in cases in which the hands are involved, leaves these organs covered with a seamed, corded, rugous, and irregularly roughened epidermis, which has given pellagra its distinctive title.

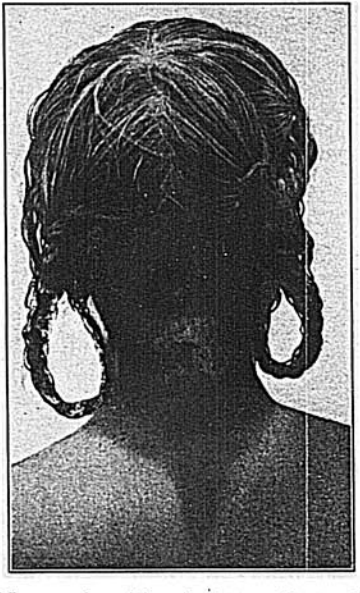

FIG. 5.—Pellagrous erythema of the neck, moist type. (Courtesy of Dr. Zeller.)

In cases in which a vesico-bullous efflorescence occurs, the picture presented on the back of the hands, after bursting and crusting

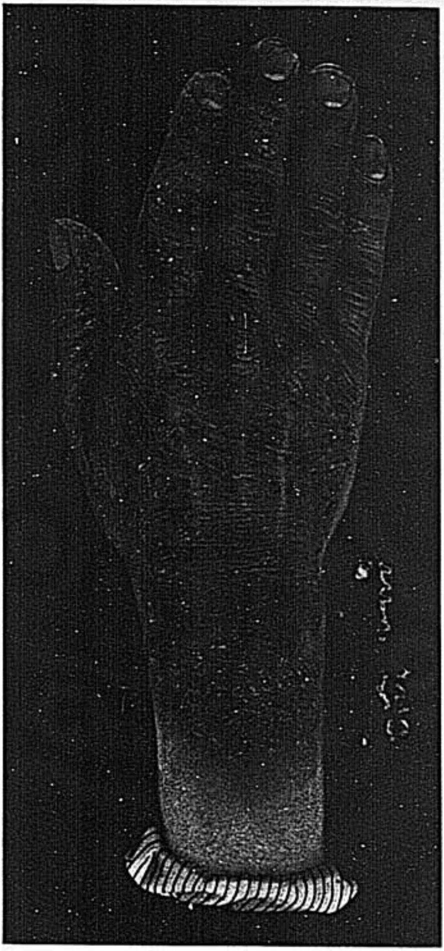

FIG. 7.—Atrophy of the skin of the back of the hand succeeding pellagrous erythema. (Reproduced through the courtesy of Prof. Ludwig Merk, of Innsbruck.)

have been accomplished, is that of the skin which has been the seat of artificial vesication (Fig. 6). A granulating surface where the epiderm has been removed becomes covered with a new and tender horny layer, which presents itself with limits furnished by the ragged, partly adherent, and slightly loosened fringes of dirt-colored skin. In cases in which no fluid has been effused, the affected surface scales in larger or smaller flakes of loosened epithelium. After one or more attacks of pellagrous erythema, the skin atrophies, leaving in the site of the exanthem a thinned, cicatriform, parchment-like integument, this last often irregularly altered, the thinning showing occasionally in striæ parallel with the long axis of the hand, rarely as a definitely bordered scar, such as follows ulceration of the integument (Fig. 7).

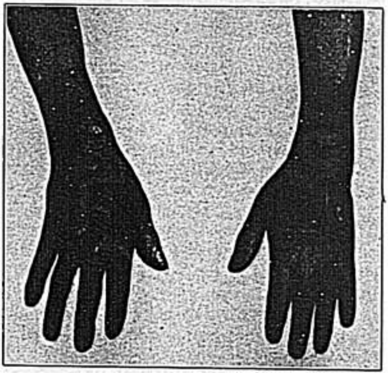

FIG. 6.—Pellagrous erythema of the hands, bullous type. (Courtesy of Dr. Zeller.)

In severe cases, however (one such was shown us in Columbia), after the onset of the exanthem, ulceration occurs on the backs of the hands. In a few of these the sheaths of the tendons have been exposed. When recovery has ensued, the scarring has not resulted in attachments to the tendinous sheaths.

In several patients seen by us in Bartonville, the pellagrous erythema was complicated with very marked ecchymoses. These were visible in deeply empurpled patches of otherwise typical areas of erythema. In a negro woman, shown us by Dr. Babcock, in Columbia, an odd-looking, lunar-shaped, ecchymotic area, its concave border upward, was visible beneath each lower eyelid.

The severity of the roughening of the skin of the hands and other regions displayed in the severest types of cases (rugous folds interspersed with furrows of atrophied, scaling, or deeply pigmented and discolored integument) can readily be distinguished in the body after death. This feature is in contrast with some of the severe dermatoses of the body which, post mortem, are scarcely demonstrable.

The pellagrous exanthem is of the order of the toxic erythemas in general, a local expression of a systemic disorder. That its manifestations are awakened by the action of the actinic rays of light upon the exposed surfaces of the skin is incontestable. That this is not solely a reactive result of exposure to such rays is equally clear. Reference is made above to erythema exsudativum, as it is called chiefly in Europe, a disorder due to a systemic infection, yet accompanied by local eruptive phenomena, not invariably, but often, limited to the hands. Arsenical pigmentations and verrucæ of the palms and soles are illustrations of a chemical action not always, but often, having a similar localization. The familiar syphilides of the palms and soles exemplify the localization of symptoms in a disorder which often is exhibited by lesions elsewhere situated, but which for years may be betrayed solely by manual or pedal symptoms. Explanations of these facts are not difficult. The hands and feet are organs not only situated at the greatest distance from the circulatory centres, but also far more exposed than other parts of the body to the accidents of contact with the external world. Dr. Michell called our attention to the frequent congestions of the hands of insane patients, due to their habits.

Many subjects of melancholia and other mental disorders can be seen in the buildings and about the grounds of asylums with their hands depending listlessly by the side and unmoved for hours at a time.

Though the systemic condition is no less essential, the rays of the sun are actually requisite for the production of pellagrous erythema. The result is comparable to that obtained when a chemical reagent is added to a solution containing a suspected ingredient, and which at once demonstrates the presence of the latter by causing a precipitate.

Experiments have been made by exposure of the hands to the sunlight when the organs were partially protected with gloves fenestrated so as to admit the rays to the skin to definite regions only. In these instances the erythema has been limited to the parts exposed to light through the fenestrations. That the sunlight in pellagrous erythema is effective merely because of the weakened resistance of the tissues in the class of patients chiefly liable to the disease is disproved in a photograph shown by Dr. Zeller. The patient, a woman, had paralysis of one hand. The paralyzed hand was spared; the back of the other hand became the seat of a characteristic rash.

It is especially noteworthy that, given the general toxemia, even feeble exposures to solar light suffice to determine the exanthem. Prolonged exposures are not essential to the awakening of the local efflorescence. This fact was emphasized by the condition of the hands of a patient shown us in the Elgin Asylum. The patient, a woman, suffering from melancholic dementia, had been bedridden for years, and occupied a room in common with another insane woman, also pellagrous. The first patient occupied a bed at the farther extreme corner of an apartment lighted by a single window. The only light accessible for a long period prior to the advent of the pellagrous disorder was furnished by this one window. Yet the hands of this woman, who was suffering from an incoercible diarrhœa, exhibited a perfectly classical picture of the pellagrous "glove," the deep staining of the skin of the hand reaching the wrist, where it was sharply delimited by the cuff of the sleeve worn in the bed. This woman soon after died, and was found, post mortem, to have had fatty degeneration of the liver and other organs.

An interesting control of this fact is furnished in the experience of the Inspector of Insane Hospitals for the State of New York, Dr. Russell, who has examined thirty thousand insane patients under his supervision, presumably as much exposed to sunlight as any of those in Illinois or South Carolina. None of this large number was recognized as pellagrous.[1]

The differential diagnosis of pellagrous erythema is not obscure. Majocchi, in describing the conditions of the hands resembling the pellagrous skin, occurring in patients who are the subjects of chronic alcoholism, declares that the "pellagrous glove," with its distinct limitation at the wrist, is usually wanting; the affection is less often symmetrical; too often extends in an irregular line along the lower forearm; lasts for a longer time; and the ensuing pigmentation is of later occurrence.

The several manifestations of erythema multiforme which affect the hands, both papular and bullous, certainly exhibit different shades of color. The peculiar crimson quality of the isolated papules and tubercles seen in that affection on the backs of the fingers and the hands almost never fuses into a sheet of puffy redness in that situation; never presents the picture, viewed from the back, of the gloved hand. Weeping eczemas of the back of the hand could not be mistaken for a pellagrous exanthem, seeing the invariably irregular contour of the affected patch, its special itchiness, its peculiar color, and persistent ooze on slight provocation.

It may be unsafe at this time to assume that the shade of color seen in a type case of pellagrous erythema, observed at the date of full evolution of the eruption, is unique and characteristic. But one is tempted to such a conclusion after close inspection of a hundred patients. In a typical case, to the eye trained in nice discrimination of shades of color, the special hue of the pellagrous skin is unmistakable. There is a quality of reddish-brown in the uniformly stained and puffy integument which confirms the diagnosis. Certainly, the pre-variolous rashes in a menstruating woman, the toxic erythema of Asiatic cholera, and the burns, whether of the first or second degree, produced by the action of solar light, of steam, and of heated water, in the white race, exhibit no such characteristic tint.

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[1] Personal communication.

In what has been described as the second stage of pellagra, the nervous and psychical disturbances first betrayed in the vertigo, headache, backache, tremor, and lassitude experienced in the early period of the disease, become more pronounced. A profound mental depression, often resulting in settled melancholia, occasionally alternating with periods of psychic excitability, occurs in most instances, and may be followed by stupor and hallucinations. Only a small proportion of patients observed abroad become insane. The symptoms of what has been termed "true pellagrous insanity" differ so widely that at this point the student of the disease is confronted with a confused multiplicity of symptoms, contrasting with the uniformity of the cutaneous lesions to which attention has been directed. While the body-weight in these cases decreases, the patient often refusing food, he frequently becomes the victim of hallucinations, delusions respecting guilt, persecution, and attempts upon his life. In rare cases epileptiform and even cataleptic seizures occur. Seeing that pellagra occurs among the tuberculous, the syphilitic, the subjects of tabes and tabo-paralysis, of dementia paralytica, of uncinariasis, of amœbic dysentery, of bilharzia disease, and of other affections, it is not surprising that a distinct and characteristic imprint of the pellagrous poison upon the brain and nervous system does not seem to have been clearly determined.

Scheube and other writers have called attention to the tendency of demented pellagrous patients to commit suicide by drowning (hydromania), for the reason, it is surmised, that the subjects of the hallucinations common in this disorder are impelled to the act by a vague desire to cool the burning mouth or the irritated skin. But a comparison of statistics leads to the conviction that there should be some reserve in accepting these conclusions. From the admirable *Dunning Report of Pellagra in Italy*, it appears that in that country but 10 per cent. of pellagrous patients become insane. Now, the deaths from pellagra per 100,000 inhabitants in Lombardy, which may be called the home of pellagra, amounted in 1907 to a total of 10.4. In Veveto, which suffered more than the other provinces, the percentage of deaths from pellagra in 100,000 of inhabitants for the same year was 18.4, the highest obtaining in any of the provinces for the year named. Granting that but one in ten of these patients died insane, and supposing that of these even one in three managed to commit suicide by drowning, the deaths from that cause would only equal the number (0.6) of suicides by drowning in each 100,000 of sane and insane inhabitants of the entire United States for the same year, the number for each year from 1900 to 1907 being practically the same.

Even allowing for the possibility that some victims of pellagra not insane ended life by drowning, and, further, assuming that other patients under proper surveillance made futile attempts at self-destruction, the figures yet speak for themselves.

The gastro-intestinal symptoms of pellagra, as has been seen, occur in all stages of the disorder, and not rarely constitute its most intractable feature. Often the characteristic diarrhœa, equally severe day and night, accompanied by meteorism and pyrosis, develops simultaneously with the erythema. The redness of the tongue, whether of the mild or of the "bald" variety, which results from an exfoliation of the buccal epithelium, in some cases is associated with profuse salivation. In one of the patients, a colored woman, shown us at Columbia, the saliva flowed freely from the lips. Dr. Babcock, in this connection, pointed out in some of the patients a peculiar, pinpoint-sized, blackish or bluish-black pigmentation occurring at the apex of some of the filiform papillæ of the tongue, an observation confirmed by Watson in a number of negro patients (Lavinder's "stipple tongue"). In some cases these conditions of the buccal membrane have coincided with similar changes in the rectal and vaginal mucosa. In many instances patients exhibit the severest symptoms of dysentery, with bloody evacuations. In the terminal stages of pellagra, peristalsis of the intestine may cease. In exceptional cases there is constipation rather than diarrhœa. Nesbit, reporting the results of his stomach analyses in 10 cases, found 4 showing marked diminution of acidity of the gastric juice, and 5 with excess of mucus. There did not seem to be any change in motility.

The so-called third, or terminal, stage of pellagra has been described as typhus pellagrosus. The condition is one in which there is merely grave accentuation of the symptoms declared in the other artificially classified stages of the disease. No typhus, as that term is now understood, is present, and Bacillus typhosus (Eberth) is not demonstrable. The patient may have a symptomatic fever, declared for the first time during the progress of the disease. He is usually profoundly prostrated; there is extreme weakness from the intestinal flux which has preceded, with emaciation and stupor, or mild delirium. The diarrhœa at the last may intermit.

A striking feature of this terminal stage is opisthotonos, the patient lying upon the bed with the head forcibly extended, the general musculature in a state of great rigidity. Oddly enough, this is one of the few constant symptoms of the disease in its final stage. Coincidently, there is extreme tenderness of the loins and back, less directly over the spinal region than over the points where the spinal nerves make exit from the vertebral canal, a few inches from the spines on either side. This was exceedingly conspicuous in one of Dr. Watson's patients shown us, to whom reference has been made, a negro lad in the last stages of pellagra who, attempting to stand and walk, accomplished these acts with a rigidity of the muscles of the trunk and extremities simulating the symptoms seen in dengue fever.

When investigating the neurological phenomena of pellagra, Dr. Bassoe, of our commission, was able to make a careful examination, extending through the greater part of two days, of a group of selected patients in the Peoria State Hospital.

Practically all of these patients were in an advanced state of dementia, utterly precluding inquiry into their subjective symptoms, especially those relating to sensation. Inasmuch as all the subjects were reported to have been insane for years before the appearance of symptoms suggestive of pellagra, they could not be suffering from true pellagrous insanity, and their mental state was not of special significance in connection with this inquiry. In almost all the cases, examination, not merely of sensation, but of all functions requiring coöperation on the part of the patient, being out of the question, we were limited to testing the reflexes, and even this in many instances was difficult. The chief aim was to reach some conclusion respecting the frequency of signs of degeneration in the cord or peripheral nerves.

Fourteen men and eleven women were examined. Four men and eight women presented sufficiently marked increase of the tendon-reflexes to suggest the probability of some degree of degeneration of the pyramidal tracts. One of these men and four of the women had a more or less constant Babinski sign. One woman and one man presented signs of degeneration of the posterior columns alone, as most of the tendon-reflexes were lost; others were greatly reduced; the woman also was extremely ataxic. One woman probably had a combined degeneration of the pyramidal and posterior tracts, as there was loss of tendon-reflexes, with an inconstant Babinski sign on one side. No instance of local or multiple neuritis was observed. We could find no reason to believe that any of the cases with changes in the reflexes were instances of combined pellagra and tabes, spinal syphilis, multiple sclerosis, or other independent organic nervous disease. The following are examples of the three groups encountered:

A. *Probable Pyramidal Tract Degeneration.* Case I.—Demented male epileptic, aged thirty-seven years, admitted April, 1902; previously at a poor farm and another State hospital. Insane for nineteen years. Diarrhœa and erythema of the hands during the past summer. The hospital record mentions increased tendon-reflexes and positive Babinski sign on August 31, 1909. Examination on October 10 revealed increase of all tendon-reflexes without clonus; inconstant Babinski and Oppenheim signs; pupils react to light. There is slight swaying in Romberg's position, but the patient walks well and the heel-knee test is as good as can be expected in a demented subject. A note was made on October 31 that he had had stomatitis and diarrhœa for several weeks, and lost forty pounds in weight.

B. *Posterior Column Degeneration.* Case II.—An elderly demented woman developed characteristic skin lesions in August, 1909. Ataxia is so marked that she cannot walk or stand alone. The wrist, elbow, knee, and ankle-reflexes are lost. No Babinski sign. No involuntaries. Pupils normal. Characteristic erythema of the hands and face when examined on October 10.

C. *Combined Degeneration.* Case III.—A woman, aged fifty years, was admitted in November, 1908, with a history of having been insane for fourteen months. On admission she was fairly well nourished and the tendon-reflexes were normal. The psychosis was melancholia of involution. On August 27, the wrist- and elbow-reflexes were recorded as normal; the knee-reflexes as increased. No Babinski sign at that time. On October 10 she was emaciated, with severe stomatitis and diarrhœa. The wrist-jerks and the left elbow-jerks were absent; the right elbow-jerk, weak. Knee- and ankle-jerks absent. Inconstant Babinski sign on the right side; normal flexor response on the left side. The pupils reacted rather sluggishly to light. She died on the following day. No necropsy. It seems probable that the pyramidal tracts were first involved, causing increased knee-reflexes. Later, the posterior columns degenerated sufficiently to abolish nearly all of the tendon-reflexes.

Nine patients affected with typical pellagra were selected at this time by Dr. Davis, of our commission, for blood examination from the abundant material available. They were fairly representative cases, and should present in a general way the blood picture as it appears in the disease as it existed in Peoria.

BLOOD EXAMINATION IN CASES OF PELLAGRA.

Blood cultures.	Erythrocytes.	Hemoglobin.	Color index.	Leukocytes.	Polynuclears.	Small mononuclears.	Large mononuclears	Eosinophiles.	Basophiles.
Negative	4,514,000	86	0.95	7,600	79.6	12.3	6.4	1.2	0.5
"	2,816,000	71	1.20	24,000	74.6	13.7	11.7	0	0
"	4,736,000	86	0.90	20,600	67.3	19.1	19.6	0	0
"	4,616,000	77	0.84	15,500	59.6	25.4	14.5	0.5	0
"	4,040,000	86	1.05	14,600	70.0	23.1	6.4	0.5	0
"	3,760,000	78	1.04	13,500	77.5	11.4	10.6	0	0.5
"	3,390,000	76	1.12	13,050	65.5	28.0	6.6	0	0
"	4,040,000	77	0.95	13,100	65.8	9.2	24.2	0.8	0
"	3,464,000	77	1.10	14,300	74.1	20.0	5.5	0	0.4
Average	3,930,700	79.3	1.01	15,140	69.77	18.02	11.72	0.33	0.16

Blood cultures were made, using for media ascites broth and plates of agar. The blood, obtained by withdrawing 5 to 10 c.c. from a vein at the elbow, was distributed into large tubes of broth, to which ascitic fluid had been added in the proportion 4 to 1, and into melted agar tubes, which were at once poured into plates. The tubes and plates were then placed under aërobic and anaërobic conditions and examined from time to time for growth. In all cases the results were negative. Generally, the cases showed a slight grade of anemia. The red cells varied from 2,816,000 (Case II) to 4,736,000 (Case III). The hemoglobin (the Dare instrument was used in all cases) varied from 71 per cent. to 86 per cent. The color-index ranged from 0.84 to 1.2, five of the cases having an index a trifle over 1. In Case II the index was sufficiently high to suggest the type of pernicious anemia. In this case the red cells were counted twice and two hemoglobin determinations made, with substantially the same results. The average index of the nine cases is 1.01.

In connection with these results, the fact should be noted that nearly all of these were bedridden patients, in whom the peripheral circulation was sluggish. This would tend to give higher readings, and due allowance should be made for this condition.

The number of white corpuscles in this series of cases is strikingly uniform. The lowest count was 7600 (Case I), and the highest was 24,000 (Case II). In most of the cases the number ranged from 13,000 to 15,000. Differentiation did not give marked variations from the normal. The polynuclear cells varied from 59.6 per cent. to 79.6 per cent., the average in the 9 cases being 69.7 per cent. The small mononuclears ranged from 9.2 per cent. to 28 per cent., averaging 18.02 per cent., and the large mononuclears varied from 5.5 per cent. to 24.2 per cent., averaging 11.72 per cent. This is somewhat in excess of the normal number of large mononuclears, which is usually given as 5 to 6 per cent. The increase, as shown by the table, occurred in 5 of the cases, the other 4 giving normal percentages of these cells. It is especially noticeable in Case VIII. Basophiles were rare, as were also the eosinophiles. In only 4 of the cases were the latter found, and then usually only after counting several hundred leukocytes. Over a thousand leukocytes were counted in some of the cases without finding a single eosinophile. Especial attention was given to these cells, for the reason that an eosinophilia is often found in various skin diseases, and also in conditions in which the intestinal tract is infested by animal parasites. Inasmuch as intestinal symptoms were common in these cases,[3] in addition to the skin lesions, this point seems noteworthy. Myelocytes were not found in any of the cases, nor were nucleated red cells encountered. The erythrocytes in stained preparations gave no evidence of polychromatophilia or poikilocytosis, and basophilic degeneration was not observed.

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[3] Postmortem examination in Cases III, VI, and VII of this series revealed inflammatory or ulcerative lesions in the intestinal tract. In these cases also amœbæ were reported to be common in the stools.

Compared with the observations made by others on pellagra cases, the results here recorded agree in that a mild grade of anemia was found, and also in the fact that many of the cases gave an increase in the large mononuclear cells. According to Lavinder and others, a leukocytosis is not usually found, except in association with secondary complications, which not infrequently occur, especially in the later stages of the disease. Postmortem examination of some of these patients disclosed, for example, lesions of the intestine which may have been responsible for the leukocytosis observed. Such lesions, however, are not rare. If they constitute an essential part of the pathology, the fact has not been definitely established.

These results are practically those reported by other observers at the Pellagra Conference. For the most part (there was but one exception) the eosinophiles were unmistakably few and the mononuclears numerous, the increase being in cases noteworthy. Microörganisms, save in the exceptional hematozoa cases, were absent. Howard Fox, after an examination of 30 cases in Columbia by the Noguchi modification of the Wassermann test, found that in pellagra there was no positive reaction. When weak reactions were obtained, they were without difficulty distinguishable from those secured in syphilis and lepra.

The ocular symptoms in pellagra have been studied in America by Seiler, Watson, and Welton, of Peoria, who kindly showed us the record of his findings, the pellagrous conditions of the eye being compared with carefully made control observations. Pupillary changes with bilateral or monolateral mydriasis, conjunctivitis, retinitis, inflammation of the optic nerve, and especially chorioiditis, are not rare, the grade of the eye changes in general, as might be expected, presenting severity corresponding with the general symptoms. In one of the patients examined by us photophobia was pronounced. In a small percentage of the fifty-five patients examined by Welton, there was paralysis of the ocular muscles. In none were eye-symptoms recognized as pathognomonic of pellagra.

Though pellagra is not an inherited disease, its occurrence in children is noted by many writers on the subject. Pellagrous women often abort; others bring into the world infants who, when living in pellagrous districts, speedily develop the malady, the offspring being not rarely stunted, as well as deformed.

The fruit of pathological research in pellagra serves to illustrate in a conspicuous manner the marked absence of any constancy in the changes wrought by the disease. The earlier cutaneous alterations are similar to those found in the exudative erythemas, while in the terminal stages the microscopic picture is practically that presented in the senile skin. Depending on the type of the inflammatory reaction and the stage of the process when the examination is made, the histological changes vary from those found in simple erythema to those seen in marked bullous dermatitis. Still later, atrophy of the papillæ and sclerosis of the vessels of the corium with hyperpigmentation and hyperkeratinization of the epidermis are found, the latter identical with those found in the senile skin. The parenchymatous neuritis of cutaneous nerves recorded by Déjerine has not been confirmed by other observers.

Scheube, Sandwith, and Tuczek agree that in many cases there is pigmentation of many of the viscera, wasting of the muscular and fatty tissues (especially atrophy of the muscular coats of the intestine), brown atrophy of the heart, atheroma of the larger vessels, hepatic enlargement, splenic shrinkage, fragility of the ribs (Lombroso), cirrhotic changes in the kidneys, and, as respects the nervous system, either no perceptible changes, or in the brain, cord, and meninges evidences of chronic inflammation, subarachnoid hemorrhages, cerebral atrophy, and symmetrical sclerosis of the posterior columns, especially those of Goll. Occasionally the posterolateral columns in the dorsal region are similarly involved. Marie believes that these cells are, in general, primarily involved.

Harris ascribes the variability in the recognized organic lesions to the extreme chronicity of the disease and to the further fact that most postmortem observations have been made in subjects who were for a long time victims of the malady. His observations include, besides those enumerated above, atrophy of the pancreas, softening of the cord, signs of Belmondo's "meningo-myelitis acuta," with marked degenerative changes in the myelin-sheaths of the nerves, of the nerve cells of the gray substance, and of the ganglia. Peripheral nerve changes have not been recorded.

The following is, in brief abstract, the record of an autopsy made by us in October, 1909, on one of the Bartonville subjects. It illustrates the inconstancy of postmortem results in some of these cases. The negative findings are not enumerated:

W. E., aged forty-two years, developed pellagra early in August, 1909. The cutaneous and other symptoms subsided, but recurred four days prior to the date of the autopsy. Recent symptoms included severe abdominal pains, diarrhœa, and a scaling dermatitis of the hands.

Anatomical Diagnosis. Moderate grade of dermatitis of the dorsum of the hands; right serofibrinous pleuritis; healed tuberculosis of the pleura; chronic suppurative cholecystitis; chronic ascending cholangitis; cholelithiasis; multiple abscesses of the liver, with rupture into the peritoneal cavity; acute suppurative peritonitis; acute splenitis; acute nephritis; icterus; pigmented Peyer's patches; acute purulent tracheitis and bronchitis; fibrous adhesions about the gall-bladder and in the lesser peritoneal cavity; obstruction of the common bile duct. *Bacteriology*: From the bile, peritoneal fluid, heart's blood, pericardial and pleural fluids, Bacillus coli communis was obtained in pure culture.

Nichols found a very high percentage of protozoal infections of the colon in the pellagra patients examined by him in the Peoria State Hospital, and at the Pellagra Conference exhibited sections of intestine with unmistakable ulceration of the mucosa, the result of amœbic dysentery. Schreiber, however, in three patients who were not amœbic, recognized, post mortem, superficial ulcerations of the mucosa of the colon.

A survey of the records of pellagra in this country suggests an inquiry which seems to have attracted but little attention up to the present time, as to whether the majority of patients in America were first insane and later became pellagrins, or whether they were first pellagrous and later, either as a complication or a consequence of the affliction, became insane. This question is somewhat intricately bound up with another, namely, for how long a time has pellagra actually existed in the United States?

Some of the physicians of the South are disposed to believe that pellagra has claimed its victims in this country for twenty-five years. Williams and Mobley cite cases which seem to have been well-marked instances of pellagra, occurring twelve and ten years ago. Watson exhibited to us in Columbia a negro boy, twelve years of age, whose symptoms were of the most pronounced and classical type—cutaneous, digestive, nervous, and ocular. He had suffered for five years, and for two years continuously with cutaneous lesions (pellagrous "gloves," "boots," Casal's "neck-band," etc.). Several superintendents of asylums are reperusing letters and reports sent in the past by members of families to whom either the bodies of dead or restored patients had been returned, complaining of maltreatment of these individuals by attendants through scalding the hands and other parts of the body—instances of what is now believed to have been pellagra. Zeller cites one such case in which a nurse had been dismissed in disgrace, but was restored to duty after the facts were more fully understood.

On the other hand, the evidence that many inmates of asylums were insane before they became pellagrous seems conclusive. These are often ex-inmates of workhouses, pauper asylums of different sorts, debilitated long before their admission to the institution where they were recognized as pellagrous, their lives rounding out a full measure of misery and physical degeneration. The mouths of many are in the worst possible condition. One cannot conceive of a class of subjects more fit for the invasion of the special poison of pellagra. The fact that the insane may become pellagrous is by no means newly attested. Brière de Boismont, Billot, and others describe in detail pellagra as "manifested during the course of mental disease." Baillarger cites cases in which pellagra appeared some time after the admission of insane patients to the asylums in Turin.

An important point in favor of the conclusion that the insane of some of our asylums have recently become pellagrous is to be found in the character of the skin symptoms. It is within bounds to declare that the most of the cases seen by us showed face, hand, and neck symptoms belonging to the early rather than the late pellagrous stages, as evidenced by the vividness of the erythema and the absence of the atrophic sequels of the invasion of the skin.

It is noteworthy in this connection that the same question respecting the prior existence of pellagra was asked when the malady first appeared and spread in Italy to such an extent as to arouse the attention of the physicians of that country. It has, however, been generally accepted that there could have been few cases observed by medical men before the middle of the eighteenth century, as the symptoms of the disease were then scarcely enumerated in literature.

The cause of pellagra is unknown. It would exceed the compass of this article to set forth the arguments pro and con of the "zeïsts" and "antizeïsts," namely, of those who do and of those who do not believe that the ingestion of maize is responsible for the disease. On the one hand stands Sir Patrick Manson, who categorically disputes the position that either the nutritive ingredients of sound corn, or toxin which it may contain, or even fungi or bacteria (Bacillus maïdis, Ustilago maydis, Bacillus pellagræ, Penicillium glaucum, Aspergillus flavescens, fumigatus, varians, etc.) accidentally developed on the grain are, any of them, effective. It is true that one of his arguments is weakened today by his citation of the United States as a corn-eating and pellagra-free community. It is certain that those who have never consumed corn have had pellagra. It is equally certain that experimental consumption of spoiled corn by man has not resulted in the development of the disease. Further, it is undemonstrated that cattle suffering from "blind staggers" and other disorders, as well as chickens dwarfed after a diet of "pellagrozein," as Lombroso termed it, were victims of pellagra.

On the other hand, to the mass of evidence in favor of some connection between the consumption of maize and pellagra collected by skilled observers and scientific men in various parts of the world, a conservative judgment cannot fail to assign value. The National Pellagra Conference held in Columbia (1909) assumed a judicious position by declaring: "That while corn is in no way connected with pellagra, evidences of the relation between the use of spoiled corn and the prevalence of pellagra seem so apparent that we advise continued and systematic study of the subject, and, in the meantime, we commend to corn-growers the great importance of fully maturing corn on the stalk before cutting the same."

Recognizing, however, a fact of importance in this connection, namely, that pellagra has occurred in persons living on a diet consisting largely of durra (Indian millet, Guinea corn), it is probable that a much wider scope must be allowed for the play of the special toxin effective in the production of the disease, if its etiological factor is ever demonstrated to be closely related to a cereal diet.

The full report by Dunning on Pellagra in Italy would seem to furnish overwhelming support to the proposition that maize is responsible for pellagra, were it not for the evidence it presents of efforts on an enormous scale put forth by the Italian Government, not merely in the direction of excluding maize, and especially spoiled maize, from the dietary of their peasantry, but also in the line of a wide improvement in the general hygienic environment and food of the people. The admittedly impoverished condition of the great mass of sufferers points unmistakably to the predisposing causes of the malady. The setting of these aside in large measure has naturally produced a noteworthy change in the statistics of the disease in Italy. How far these can be cited as arguments in favor of the zeïstic origin of pellagra is questionable. The indisputable facts in this connection are the occurrence of the disease as an endemic; its practical limitation within definite geographical limits; its involvement of men, women, and children, at all ages, but especially of adults between the third and fifth decades of life; and that its victims everywhere belong to the class of those whose resistance is weakened by poverty and such of its attendant ills as insufficient and improper food, exposure, and unremitting toil.

The brilliant successes in the management of pellagra have been secured by prophylaxis. Amelioration of the environment, food, and mental state of pellagrous patients living in pellagrous districts has worked surprising results.

The Italian campaign against pellagra has been conducted by enactment of laws providing for inspection and condemnation of suspected food imports; by requiring registration of all pellagrous cases; by the establishment of pellagrological commissions, such as that recently authorized by the Illinois Legislature;[4] by founding pellagrosarios, institutions for the care of the sick; by distributing proper food to destitute families; by erecting "economic kitchens" and rural bakeries, where food of proper quality is supplied at a low price; by appointing commissions (*Cattedre ambulanti*) for instruction and encouragement in improved methods of agriculture; and by providing public desiccating plants for drying maize, and public storehouses for its preservation. An elaborate system of public education has also been put in operation by lectures and distribution of pamphlets. The happy results are worthy of study as well by the economist as by the physician.

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[4] The Governor of Illinois has appointed a commission to report upon pellagra in the Charitable Institutions of the State, consisting of the following-named gentlemen: Dr. Frank Billings, Chicago; Dr. J. L. Greene, Springfield; Dr. Geo. W. Webster, Chicago; Dr. H. S. Grindley, Urbana; Dr. Howard T. Ricketts, Chicago; Dr. Oliver S. Ormsby, Chicago; Dr. H. Douglas Singer, Hospital; and Dr. W. J. McNeal, Urbana.

Compared with these, the fruits of medication of those who are infected are scarcely worth naming. Arsenic by the mouth and by hypodermatic injection, atoxyl administered by both methods, quinine, strychnine, iron, have been both praised and adjudged of little value. Drs. Cole and Winthrop, employing transfusion with the blood of both cured pellagrous and non-pellagrous subjects, seem to have secured satisfactory results in a few cases. Today the best accepted treatment of the disease is that which is indicated in individual cases by the symptoms presented, always having in view the imperative demand for improved nutrition.

The extent of the prevalence of pellagra in the United States is set forth in the observations of Lavinder, who has had opportunities for the observation of the disease in all parts of this country. The first cases were reported by Dr. Gray, of New York, and Dr. Tyler, of Massachusetts, at the meeting of Asylum Physicians, held in Washington, D. C., in 1863 and 1864. Before these dates there had been reports of isolated cases occurring near Halifax, N. S. I was present at the meeting of the American Dermatological Association, in 1902, when Dr. Samuel Sherwell, of Brooklyn, reported two cases occurring in Italian sailors found pellagrous after entering the port of New York. Lavinder's list of those of the States where pellagra is believed to have occurred includes the names of thirteen, mostly Southern, to which Illinois and other States have since been added, making a total believed to be sixteen. Most of the cases reported are in public institutions of one kind or another, chiefly asylums for the insane. At the date of the appearance of Lavinder's leaflet it was believed that a total of one thousand cases had been recorded. The number has since increased. Dr. Kerr estimates that there were five thousand pellagrins in the United States in the year 1909.

Respecting the prognosis of pellagra, the percentage of mortality among American patients seems to be nearly 35 per cent. of those affected. Unfortunately, the larger number of fatal cases has occurred among the insane presumably affected with the disorder after admission to the institutions reporting the fatality. Statistics of pellagra in its terminal stages in this country, where the course of the disease from onset to conclusion was wholly and purely due to the pellagrous poison, are not available. Randolph, basing his conclusions upon the Florida cases, believes that about one in every four or five patients recovers. Of the series of cases studied by Siler, 22 per cent. died, 10 per cent. were failing, and 17 per cent. improving at the date of his report. In a personal communication received from Dr. Zeller since the adjournment of the Conference, he reports the death of several patients observed by us when permitted to make the observations recorded in this article. Most authors agree as to the curability of the disease in its earliest manifestations, chiefly by the aid of the generous regimen suggested above. Fritz, director of the Pellagrosario at Inzago, in a long experience, has seen but two complete cures of fully developed cases.

Physicians in all parts of the United States are now somewhat anxiously regarding the possibilities of the future respecting the progress of pellagra in this country. The history of the disease in the past points with emphasis to the fact that in countries where it has once attacked the population it recurs with somewhat alarming regularity, save when such elaborate measures of repression have been adopted as those briefly outlined above in connection with the campaign against pellagra in Italy. What will be the issue of the oncoming spring and summer when, according to the common mode of the malady, its recrudescence in a severe form might be anticipated? It is probable that there may be during the year 1910 a considerable increase in the number of cases reported.

But he has poorly comprehended the economic equations of our national resources who looks to see pellagra work such havoc in this country as among the smitten peasantry in the provinces of Bergamo, Brescia, and Venetia. It has been aptly said of the poor of America that they do not know what poverty is. Incredible as it may sound to those unfamiliar with the fact, a large number of the applicants to public charities, in the Northern States at least, are food-poisoned by sheer glut. They are not even strangers to the gout.

The lessons of pellagra are writ too large to be neglected in any wide measure by an intelligent people. Its cause, as yet undetermined, will be revealed; its prophylaxis is already understood; it certainly will be relegated to that path whither uncinariasis has been consigned, and along which yellow fever and tuberculosis are already disappearing.

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HIGH CALORIC DIET IN TYPHOID FEVER.

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The present death rate of typhoid fever is very low, notwithstanding many serious complications which are possible. But there is much to be gained in comfort to the patient. The classical three weeks cannot be aborted, but the prospect of an average lower temperature and pulse rate with lessened meteorism, toxemia, and delirium is very alluring. By due regard for the dietary, this end can be achieved in all but a few severe cases.

My object is to consider this subject from the standpoint of the physiologist and at the same time take account of the altered conditions in the intestinal tract and the deviations from normal metabolism. If the subject is approached with a spirit of fairness and with a desire to examine closely the more exact experimental evidence, one can hardly escape the conclusion that the use of milk and various "peptone" preparations is based on prejudice and precedent, and has little else to commend it. To recommend indefinite quantities of foodstuffs without inquiry into their chemical architecture and the needs of the patient is inexact and unscientific. Shaffer[1] has estimated that the typhoid fever patient rarely receives more than 50 per cent. of food necessary to supply dynamic needs. This usually contains at least three times more nitrogen in proportion than would be advisable to allow a healthy individual. Naturally the balance of the dynamic needs must be met by the body tissue with consequent loss of weight and increasing weakness.

The use of milk—plain, fermented, or digested—is strongly intrenched in American practice, and it is difficult to obtain consideration of other foodstuffs. The argument that milk is "easily digested" loses force in direct proportion to the number of curds in the stools and the degree of meteorism. If sufficient is given to meet dynamic needs, the bulk is almost prohibitive. It neither protects against nitrogen loss (if that is desirable) nor does the chemical structure of the casein molecule permit of its rational use.

The favorable results obtained with Seibert's[2] soup diet led to this article. He does not use milk. The relative amounts of protein, fat, and carbohydrate are difficult to estimate, but there is a commendable increase in energy producing elements. The cases reported are sufficiently numerous to draw satisfactory conclusions concerning the death rate. But most convincing to the judicial observer is the frequent absence of necessity for baths and

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[1] Jour. Amer. Med. Assoc., 1908, ii, 974.
[2] Medical Record, June 20, 1908.